
COLUMBIA RIVER CHANNEL IMPROVEMENT PROJECT

**TECHNICAL REVIEW OF THE BENEFIT AND COST ANALYSIS
IN THE DRAFT SUPPLEMENTAL INTEGRATED FEASIBILITY REPORT
AND ENVIRONMENTAL IMPACT STATEMENT DATED JULY 2002**

SUMMARY REPORT OF THE TECHNICAL REVIEW PROCESS AND RESULTS

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August 5-9, 2002
Fifth Avenue Suites Hotel
Portland, Oregon

SUMMARY REPORT OF THE TECHNICAL REVIEW PROCESS AND RESULTS

Executive Summary

Context and Background. The US Army Corps of Engineers, Portland District, is in the process of reviewing and reassessing the Columbia River Channel Improvement Project. In July 2002 the Corps revised its economic analysis of the project to reflect new information and cost estimates for completing the project. The Corps developed new costs, reexamined the benefits and the benefit to cost ratio, and updated the report. The Corps released the *Draft Supplemental Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement* (DSDSIFR/EIS) for public comment on July 10, 2002. The Corps convened two groups of technical experts in August 2002, one to review the benefits analysis and the other to review the cost analysis in the DSDSIFR/EIS. (See Attachment A for a list of panel members.) This report summarizes the technical review process and presents the results.

The Task of the Panels. The specific task set before the panelists' was to provide their individual views and opinions in evaluating (1) whether the assumptions, methodology, interpretations, and conclusions based on analyses of the benefits and costs of a 43 ft. channel are reasonable; and (2) whether the Corps used data properly in their overall analysis. Panelists were able to comment on any aspect of the benefit or cost analysis. Panelists were not asked to judge or to recommend whether the project should or should not be implemented.

Summary Results of the Cost Panelists' Review

1. **Channel Design.** The typical overdepth for new work dredging would be the same as recent maintenance dredging. Dredging should be accomplished with an average overdepth of one ft. in sandy river bed reaches. In the rocky reaches, an additional foot should be added to the required depth to accommodate future maintenance dredging.
2. **Production Rates for All Dredge Types.** The dredge cuts will behave more as maintenance dredging cuts. The loose, mixed nature of the silty sand sediment will allow the dredge material to flow to the dredge and not behave as the more dense,

consolidated material characteristic of new work virgin cuts. Because new work dredging will behave like maintenance dredging, the Corp's 5% increase in dredge time for new work is too conservative and is not reasonable.

In channel areas where the advance rate of the dredge will control cutterhead production (i.e., where 67% of channel includes dredge faces less than four ft.), the Corps' estimates is too conservative. Production rates for larger cuts, greater than 10 ft., appear to be reasonable while rates for dredging intermediate faces, four to 10 ft., would require further analysis to determine if advance rate or dredge pump rate control production.

3. *Disposal Areas.* The panelists concluded that the design considerations of the Corps' cost estimate appear reasonable and complete. Appropriate cost elements, crew sizes and equipment sizes also were included in the estimate.
4. *Mobilization and Demobilization.* The Corps' proportional distribution of mobilization and demobilization costs based upon new work and operation and maintenance dredge volume is reasonable.
5. *Cost Adjustment Factors.*

The panelists noted that the narrative section of the cost estimate identifies four topic areas where panelists concluded cost adjustment factors were inappropriately applied: overdepth quantities, quantities along the channel slope, cleanup factor and hopper dredge.

Overdepth Quantities: the dredging contract should identify depth of dredging required for the project. An overdepth of one (1) ft. should be used for hydraulic pipeline and mechanical dredge, but should not be identified as a pay item.

Quantities Along Channel Slope (Sand): allowance for slope sloughing as a percentage of the dredging volume is too conservative, and is not reasonable.

Cleanup Factor: this is negligible for shallow cuts or for clamshell operation in the rock areas where dredging is not typically "new work," and is more like maintenance dredging. For deep bank cuts (greater than eight-ten ft.), a consideration for cleanup cost may be appropriate, but should be based on engineering analysis using geotechnical characteristics of slope failure and length of applicable reach, with a different value for different cut heights.

Hopper Dredging: a five percent (5%) increase in time is assumed for "new work" by the hopper dredges, but the project is virtually a maintenance dredging effort. Existing cost for maintenance dredging is an excellent basis for the hopper dredge cost estimate, without any time increase.

6. *NOAA/NMFS Report.* The panelists reviewed a report from NMFS, which was submitted to the cost panel as part of the public input. The panelists concluded that

a reasonable estimate of future maintenance dredging volumes should be based on average historic sedimentation rates for existing maintenance and existing dam river flood controls.

7. *Loadmax*. Based upon a presentation by the Columbia River Pilots' Association and the Port of Portland, the cost panelists determined that the Loadmax system and vessel movements do fully utilize opportunities for maximum water depth.

The cost panel cost did not undertake nor conduct a line-by-line review of the cost estimate.

Summary Results of the Benefits Panelists' Review

Container Vessel Benefits. The Corps's analysis of potential benefits to container shipping from channel deepening focused on transportation cost savings through greater vessel utilization achieved through increased departure depths. Much of the Corps's container shipping analysis appears reasonable:

- In many cases the Corps adopted conservative assumptions.
- Overall, the Corps used data properly.
- The exclusion of Canadian and intermodal container cargo from the benefits analysis was appropriate.
- The Corps's interpretation of their analysis is generally reasonable, although the scope and methodology issues identified by panel members constrain the reliability and accuracy of the benefits estimate.

Although apparently reasonable at the time, the absence of a multi-port analysis is no longer reasonable in light of recent information.

- The Corps's analysis to date does not capture the complexity of the container shipping market or container vessel operations, or the role of Portland as a last-call, riverine port with niche exports.
- The Corps's analysis also does not consider alternative interpretations of current and historical cargo flows and routing decisions in determining the rate of cargo capture from the Portland hinterland.

Some assumptions and methodologies in the context of reduced container vessel operating costs for Portland through greater departure depth and utilization tend to raise the estimate of transportation cost savings. In particular, the attribution of benefits to light-loading vessels significantly increases the apparent cost savings. A revised analysis of similar scope would likely yield lower benefits, while a broader, multi-port analysis that captured the inland cost issues raised in the Port's report may reveal other categories of benefits.

The Corps's container shipping analysis and reports would benefit from fuller documentation and explanation of assumptions and methodologies.

Bulk Vessel Benefits. The potential Columbia River deepening benefits from the existing bulk fleet due to increased utilization and/or reduced delay were reviewed and appear reasonable. The potential Columbia River deepening benefits from the fleet shift to larger bulk vessels under with project conditions (deepening) were reviewed and also appear reasonable.

Cargo Projections Evaluation. Overall, the different product projections were deemed reasonable and the data used were properly compiled and extracted, as least as could be determined in this review process. The overall approach of utilizing the market growth/demand in international areas, constrained by the potential supply/production within the United States, produces estimates that seem appropriate. The overall description of the future size and design depth composition of the tramp ships serving the grain trade is acceptable and appears reasonable.

Loadmax. Based on additional information and presentations on Loadmax, the benefits panel also concluded that the system is being used to its full potential.

Disagreements among the Panelists. There were no disagreements among the cost panelists. The benefits panelists only disagreed on whether two assumptions – vessel capacity limits on cargo and sources of container vessel delay – were reasonable.

Open Questions and the Plan for Addressing Them. Neither panel had questions that were not resolved during the review.

Context and Background

The US Army Corps of Engineers, Portland District (Corps), is in the process of reviewing and reassessing the Columbia River Channel Improvement Project, originally presented in the *Final Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement* (dated August 1999). In July 2002 the Corps revised its economic analysis of the project to reflect the new information and cost estimates for completing the project. The Corps developed new costs, reexamined the benefits and the benefit to cost ratio, and updated the report. The Corps released the *Draft Supplemental Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement* (DSDSIFR/EIS) for public comment on July 10, 2002.

The DSDSIFR/EIS defines the “with project” condition as channel improvements that provide for 43 ft. of water depth in designated areas of the Columbia River. The DSDSIFR/EIS defines the “without project” condition as the condition and practice expected to exist if the authorized channel depth remains 40 ft. in the project area in the absence of a 43-ft. channel improvement project. Those terms and definitions are used in this document. In addition, the term “project” as used in this report refers to a 43-ft. deep channel authorization.

The Corps convened a group of technical experts in August 2002 to review the benefit and cost analysis in the DSDSIFR/EIS. (Panel members are listed on Attachment A.) The technical review process was facilitated by RESOLVE, Inc., a neutral non-profit organization. This report, which was prepared by RESOLVE in collaboration with the panelists summarizes the technical review process and presents the results.

Technical Review Purpose and Process

Purpose

The purpose of the technical review was to provide expert analysis of the estimated costs and potential benefits of a 43-ft. deep channel improvement project as presented in the DSDSIFR/EIS. Expert analysis was provided by two panels: one consisting of channel design and dredging cost engineers to review the cost estimates (cost panel); and the other composed of marine transportation economists to review the potential benefits (benefit panel).

Convening the Technical Review Panels

The technical review process was designed by RESOLVE in consultation with the Corps. In designing the process, RESOLVE spoke with a few interested stakeholders about the proposed process steps, and their comments informed the final process design. Panel members were selected by the Corps. Members of the benefits panel were selected based on the following criteria: expertise in deep draft navigation (grains, container shipping), inland navigation and/or knowledge of navigation’s role in the Pacific Northwest regional economy; understanding of the water resource policies and procedures used in navigation analyses; and schedule availability. Members of the cost

panel were selected based on the following criteria: expertise in navigation channel design, construction, operation and maintenance, and cost estimating; knowledge of cost estimating software; and schedule availability. Each panel member affirmed that they could render an objective opinion and that there were no activities or relationships that would cause them to be unable to render objective, impartial assistance with respect to the technical review.

The Task of the Panels

The specific task set before the panelists' was to evaluate (1) whether the assumptions, methodology, interpretations, and conclusions based on analyses of the benefits and costs of a 43-ft. channel are reasonable; and (2) whether the Corps used data properly in their overall analysis. Panelists were asked to identify key assumptions and any open questions that could not be answered during the review and the plan for addressing them, and to explain any disagreements with other panel members. Panel members were asked to provide their individual views and opinions. Panelists were able to comment on any aspect of the benefit or cost analysis. Panelists were not asked to judge or to recommend whether the project should or should not be implemented.

Overview of the Technical Review Process

The technical review was conducted over a five day period, August 5-9. The process began and ended with public meetings. In the middle the panelists met for three days in working sessions. (A copy of the agenda is included as Attachment B.) Prior to the opening session, panelists were sent a copy of the DSDSIFR/EIS, together with background and other supporting material. (The advance resource material is identified in Attachment C.)

On Monday, August 5 representatives of the Corps and the Port of Portland (Port) presented and discussed the project and the key features of the cost and benefit analysis with the panelists. Members of the public were encouraged and afforded the opportunity to provide presentations to the panelists of any technical information they wanted the panelists to consider during the review. Members of the public also were given the opportunity to submit written questions to the panelists.

For the next three days, Tuesday, August 6 through Thursday, August 8, the panels met separately in closed working sessions to further review the DSDSIFR/EIS and associated documents. On Wednesday, August 7 the benefits panel met with a representative of the Corps and both panels met with representatives of the Port and the Columbia River Pilots' Association. (A list of the participants in these sessions is included on Attachment A.) During the course of the working sessions, the panels requested additional information and consulted outside experts. (A list of all information requested and persons contacted is included on Attachment C.)

On Friday morning, August 9, in a public meeting, the panelists presented a summary of the results of the technical review. At this meeting, the panelists also responded to

questions from representatives of the Corps and the Port, and the public. (A copy of the agenda for August 9 is included as Attachment D.)

A list of contacts by panelists with the media after August 9 is included on Attachment C.

Monday, August 5th: Public Meeting

Robert Fisher of RESOLVE opened the initial public meeting of the technical review by introducing himself and his colleagues and welcoming the panelists, the public and representatives of the Corps and Port. He presented an overview of the proposed meeting agenda and the ground rules. He then invited the panelists and presenters to introduce themselves. The roster of panelists, presenters, public attendees and facilitation team members is included in this meeting summary at attachment A.

Overview of the Revised Draft Supplemental DSIFR/EIS

Laura Hicks, Project Manager at the Corps provided a brief overview of Columbia River Channel Improvement Project and the revised cost and benefit analysis contained in the DSIFR/EIS. The presentation covered the history of the project and also highlighted the enhanced ecosystem components that were not part of the Corps' original 1999 DSIFR/EIS. She explained that the cost of the Corps' plan – for the deepening and environmental restoration components – is \$149M. The Corps plan shows an annual benefit of \$18.3M once the project is completed, or a benefit to cost ratio of 1.5:1.

Ms. Hicks pointed out that an alternative plan, sponsored by the ports of Portland, St. Helens and Astoria in the State of Oregon, and Vancouver, Kalama, Longview and Woodland in the state of Washington, estimates project costs of \$156M. This alternative – referred to as the Sponsors' Plan – includes more extensive ecosystem restoration components than those found in the Corps plan.

Ms. Hicks explained that the Willamette River portion of the DSIFR/EIS was excluded from the Corps' revised cost benefit analysis of the project. She also explained that the Corps had conducted all hydrographic surveys used to calculate the volume dredged material. Finally, she expressed optimism that the panelists would provide the Corps with feedback that would be useful in further refining the cost/benefit analysis of the project.

Ms. Hick's presentation slides can be downloaded from the Corps' Web site at www.nwp.usace.army.mil/issues/crcip/review.htm.

Presentation and Discussion of Dredging Costs

Jon Gornick, Civil Engineer, and Al O'Connor, Lead Cost Engineer – both from the Corps – jointly provided extensive presentations on the engineering and administrative practices the Corps used to estimate the cost of dredging the channel and disposing of the dredged material.

Mr. Gornick gave a presentation that detailed the dredging principles the Corps used to calculate the volume of the material that would be removed and disposed of when deepening the channel. He also explained the characteristics of the Columbia River bed that the Corps could expect to encounter if the projects moves forward. Finally, he addressed the disposal areas for the dredged material and how those areas would be constructed to restore or create fish and wildlife habitats.

Following his presentation, Mr. Gornick responded to questions from the cost panelists, explaining the Corps' maintenance dredging activities and the upland disposal sites used to hold the dredged material. He also covered the types of dredges that were deployed in various reaches of the river and where the shoaling along the riverbed was most likely to occur. He noted that while some bulk cargo vessels have drawn more than 40 ft., none have drawn as much as 43 ft. Mr. Gornick stated that the Corps predicts that the volume of dredged material from regular maintenance and operation dredging in the channel would be lower than historical levels because the Corps plans to use more upland disposal sites than in-water disposal sites.

Mr. Gornick's presentation slides can be downloaded from the Corps' Web site at www.nwp.usace.army.mil/issues/crcip/review.htm.

Following Mr. Gornick's discussion of dredging operations, Mr. O'Connor reviewed the accounting systems used to estimate, bid and manage dredging contracts. His presentation focused on the wide variety of factors that must be entered into the Corps' databases to generate a dredging plan that estimates the costs of dredging the channel.

In discussing with panelists the development of the Corps' dredging plan, Mr. O'Connor explained that – with the exception of a government dredge used for regular maintenance dredging – the dredge plan anticipates using only privately owned dredges to deepen the channel, as required by the federal procurement mandate. Many of the panelists' questions concerned how the Corps' separates ongoing maintenance dredging costs from new dredging costs and how it pays dredging contractors for depths achieved beyond the current 40 ft. level, plus a five (5) ft. advance maintenance and under keel clearance.

The panel was also interested in hearing more about the extent to which the current channel is actually dredged for maintenance to a depth of 45 ft. Mr. Gornick explained that sand shoaling occurs unpredictably and rapidly along the riverbed, necessitating the ongoing efforts to ensure that the minimum channel depth is 40 ft. along the 103 mile length. Currently, 39 to 40 ft. more accurately reflects the channel's year-around minimum depth. One of the panelists also questioned the database inputs used to model the contractors' profit coefficients.

Mr. O'Connor's presentation slides can be downloaded from the Corps' Web site at www.nwp.usace.army.mil/issues/crcip/review.htm.

Presentation and Discussion of Dredging Benefits

Brian Shenk, Economics Section Chief, United States Army Corp of Engineers (USACE), provided a presentation on the revised economic analysis of the project. He explained that calculating the expected benefits of the project turned on the estimation of commodity and fleet projections. He noted that the commodity projections were based on Lower Columbia River marine cargo forecasts prepared by BST in association with DRI/WEFA. Adjustments to the forecasts were made to comply with National Economic Development (NED) requirements. Fleet projections were based on the distribution of tonnage by fresh water design draft and recent actual data.

Mr. Shenk provided a detailed analysis of the actual and projected design drafts of bulk and container vessels calling on the nation's ports. He then provided an analysis of which of these vessels could be expected to call on Columbia River ports if the channel were deepened.

The remainder of the presentation on the revised economic analysis was provided by Paul Sorensen of BST Associates. He provided a detailed forecast of US grain exports and the share of those exports that might be exported from the Columbia River if it were deepened. He also provided a detailed forecast of the container vessels that could be expected to call on Columbia River ports if it were deepened. Additionally, Mr. Sorensen addressed how trade from the Pacific Northwest region might flow to Columbia River ports if the deepening project went forward. He also briefly reviewed the characteristics and operating conditions of container vessels calling on West Coast ports.

Messrs. Shenk and Sorensen's presentation slides can be downloaded from the Corps' Web site at www.nwp.usace.army.mil/issues/crcip/review.htm.

Following the presentation, the benefits panelists expressed reservations about the extent to which the benefits analysis predicts regional trade shifting to Columbia River ports if the channel were deepened and the ability of current port facilities to handle the larger vessels that would call on the ports. They also discussed with the presenters the status of the shipping companies that currently call on the Port of Portland and their rationale for doing so.

Presentation on the Port's Container Transportation Benefit Study

James Daly, Senior Research Associate, Marine Research Department, Port of Portland provided a presentation that underscored the inland transportation benefits of the project for container cargo. His presentation forecasted the trade from the Pacific Northwest region that would flow to Portland rather than Seattle/Tacoma if the channel were deepened.

Again, the panelists expressed concern regarding the degree to which deepening the channel would attract trade away from Seattle/Tacoma. They were skeptical about the

savings that would be realized by inland shippers who chose to export their goods through Portland rather than Seattle/Tacoma.

Mr. Daly's presentation slides can be downloaded from the Corps' Web site at www.nwp.usace.army.mil/issues/crcip/review.htm.

Public Input

Time was reserved for members of the public to present technical information to the panelists for consideration during the working sessions; however, no one chose to provide information or data to the panelists. Forms to submit written questions to the panels were also available to the public attending the meeting. One question was submitted to the benefits panel, which was addressed during the public meeting on Friday, August 9 (see of the Results of the Benefits Panelists' Review, Closing Comments, below). In addition, the cost panel received a copy of a Memorandum dated December 6, 1999 from John E. Stein to Rick Applegate, of the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Northwest Fisheries Science Center, along with the Appendix 2 referred to in the Memorandum containing an assessment of the likely physical oceanographic changes in the Columbia River estuary as a result of a deepened channel prepared by Dr. David Jay of the Oregon Graduate Institute in Portland, Oregon (NOAA/NMFS Report). The cost panel reviewed the NOAA/NMFS report during the working sessions and their response to the information in the report is described below (Results of the Cost Panelists' Review, Response to the NOAA/NMFS Report).

Information Requested by Panelists

The information requested from the Corps and the Port by panelists during the meeting is included on Attachment B.

Tuesday – Thursday, August 6-8, 2002 – Panel Working Sessions

Tuesday through Thursday, members of the cost and benefit panels met separately to consider the information provided to them by the Corps, the Port and the public.

On Wednesday, August 7, the cost and benefits panelists met with the head of the Columbia River pilots and representatives of the Port of Portland's Northwest River Forecast Center. (A list of the presenters is included on Attachment A.) The purpose of this meeting was for the panelists to gain additional knowledge of how river pilots and vessel operators were using the Loadmax river level forecasting system, which yields forecasts of water depth for use by vessel operators and pilots, to plan outbound and inbound vessel voyages through the Columbia River Channel. The presentation also explained the sand wave movement along the riverbed of the channel and the characteristics of some vessels that have passed through the channel.

The Loadmax presentation slides are available on the Corps' Web site at www.nwp.usace.army.mil/issues/crcip/review.htm.

Also on Wednesday, August 7, the benefits panel met with Brian Shenk, USACE. The topics discussed are identified below in the description of the benefits panel review approach.

Friday, August 9, 2002 – Public Session

Results of the Cost Panelists' Review

On Friday August 9 the cost panel presented a summary of the results of their review in a public meeting. The following discussion of the results includes the summary material presented at the meeting, as supplemented and described in greater detail by the cost panelists in the preparation of this report.

Introduction

The cost review panelists congratulated the Corps on a job well done in completing the cost estimate for the Columbia River Improvement Project. Each panelist believed that the Corps estimate, taken as a whole is a good effort. The cost estimate has both breadth (extensive cost analysis) and depth (cost element detail analysis). The panelists also thanked the Corps personnel for their responsiveness to requests for additional documents throughout the week, noting that whenever a request was made, the Corps responded, sometimes within hours, with the requested information.

As stated previously, the cost panelists mandate was to review the project assumptions, analysis and conclusions and determine whether they were reasonable. The cost panelists did not undertake nor conduct a line-by-line review of the cost estimate.

Review Approach

Based upon the panelists' individual experience with dredging cost estimates and the Corps's presentations on Monday, August 5, the cost panel implemented the following approach for review of the project cost estimate:

1. Cost estimate items that could have significant impact on the total project cost were listed.
2. Cost estimate items, listed in 1 above, were prioritized.
3. A general review of the cost estimate and supporting documents related to the cost estimate items identified in 1 above was completed.
4. Additional information was identified, and requested from the Corps and others, and provided throughout the review (see attachment C).
5. A more detailed analysis of those cost items that, based on panel members experience and the inability to complete the logic or math for the final cost, was then completed. These cost items were selected following the general review conducted in 3, and additional information provided in response to number 4.
6. Three possible generic conclusions were developed for each cost item evaluated:

- There was not enough data to make a determination regarding reasonableness of cost estimate assumptions.
- More analysis may be appropriate for the cost element.
- Analysis and value of the cost element appeared to be reasonable/prudent.

Global Assumptions

In reviewing the cost estimate, some global assumptions were made, which as the review progressed, became global conclusions. These included:

1. That the dredging and disposal data were adequate and representative of project conditions. This data included items such as sediment volume, cut thickness, sediment type, disposal site distances, and contractor equipment type and availability.
2. That the project would be constructed as the result of a competitive bid. A competitive bid was defined as at least 2 bids and preferably 3-4 for each contract released. This is important because a competitive bid is generally required for a fair and reasonable project cost. Based upon the following analysis, this assumption was in fact valid for the equipment used in the cost estimate:
 - The availability and location of suitable contractor equipment
 - Expected production rates for the specified equipment
3. That the Corps survey and basic quantities were accurate based upon the extensive geotechnical investigations, bathymetry, sidescan sonar, and sub-bottom profiling completed by the Corps.

Summary of Topics Reviewed

The following is a summary of the topics/cost elements reviewed during the technical review. Review details and conclusions are provided in the following sections of this report for each topic.

1. *Clarification of Channel Design Template in Sand and Rock.* The design templates provided by the Corps in the Monday presentation were revisited. A key cost element was the required dredging quantity versus the gross dredging quantity. This is a critical cost item for two reasons:
 - The volume actually dredged (gross quantity) is directly related to effective dredging time and effective dredging time is directly related to cost.
 - The dredging volume impacts the required disposal area capacity, which is also directly related to cost.
2. *Production Rates for All Dredge Types.* A spot check of the production rates, and the associated effective time used for the dredging cost estimate, was completed. Once the dredging volume was established, the other major factor affecting time, and as a result the cost, was the equipment production rates. Based upon experience with various types and sizes of dredging equipment, the following was determined for each dredge type (hydraulic cutterhead, hydraulic hopper dredge, mechanical dredge):

- The limiting factors for dredge production, based on project characteristics.
 - The reasonableness of dredge cycle times.
3. *Cost Adjustment Factors.* Cost adjustment factors were applied by the Corps independent of the production rates and effective dredging time. As an example, an increase of 5% hopper dredge time for the “new work” dredging was applied to provide a conservative (decreased) overall hopper dredge production. Justification for these factor increases was not documented in the information provided to the panel. The review therefore considered the following:
 - Does the cost adjustment factor duplicate a cost factor accounted for in another analysis?
 - Is the cost adjustment factor appropriately applied?
 - Should the cost adjustment factor be replaced by another analysis?
 4. *Disposal Areas.* The cost elements of the disposal area analysis were reviewed for completeness of elements and general assumptions. As an example checks were made on inclusion of appropriate design features, and equipment and methods for construction of the disposal areas.
 5. *Mobilization and Demobilization.* The costs associated with mobilization and demobilization were reviewed based upon the following:
 - Location of available equipment (mobilization)
 - Typical contractor practices (demobilization)
 - Cost distribution of mobilization/demobilization between new work and maintenance dredging
 6. *Response to NOAA/NMFS Report.* This report was provided to the cost review panelists as part of the public input. While many of the issues raised were outside the technical review scope, those items affecting project costs were reviewed.

Channel Design

Review of the proposed channel design, and the subsequent overdepth (due to equipment inability to remove subsurface river sediment to an absolute neat line), provided the following recommendations.

The dredging prism design should reflect the anticipated contract requirements to dredge to a required elevation. Overdepth dredging will in fact occur, but the dredge contract should not include the overdepth as a pay item. This will only encourage the contractor to dredge to a deeper depth to assure they maximize their payment by removing all pay material (required depth volume plus overdepth volume). The project design, on the other hand, and therefore the cost estimate, should reflect the cost of disposal for all material dredged. The Corps’ design and appropriate cost must include the overdepth material.

Overdepth dredging volume is a function of the dredge type and the material to be dredged. It is very important to note that the material to be dredged is in fact not a

virgin bed sediment as would normally exist for “new work” dredging. The Columbia River has a relatively loose, unconsolidated silty sand material that extends to a depth below the proposed project depth of dredging. This “new work” dredging is in fact a deeper dredging of maintenance materials. The majority of the dredging to be completed exists in sediment with less than four ft. of cut thickness. The conclusion is the typical overdepth for this “new work” dredging would be the same as experienced in recent maintenance dredging on the Columbia River. Dredging by hydraulic pipeline dredge, hydraulic hopper dredge or by mechanical dredge in the sand bed reaches of this “new work” should be accomplished with an average overdepth of one ft.

The suggested dredge prism for the sand bed reaches of this project is provided in the Figure 1 below. This would include all river bars except for Slaughters Bar, Vancouver Bar and Warrior Rock Bar.

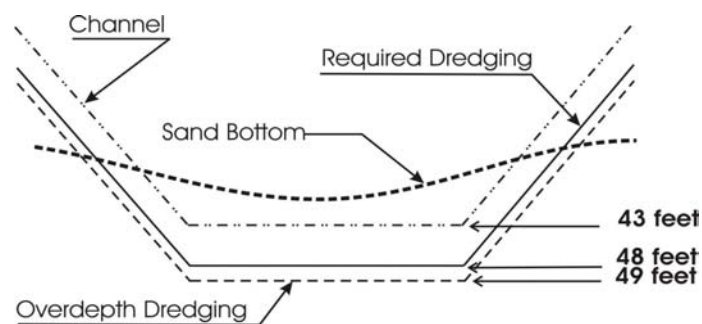


Figure 1
Dredge Prism for Sand Bed Reaches

Two different designs were presented by the Corps for the remaining three river bars. One design was for the conglomerated rock material that could be dredged by mechanical dredge (Vancouver Bar and Slaughters Bar), and the other design was for the Granite type of rock that would require blasting before removal by mechanical dredge.

It is suggested that the design for all three of these areas be the same design. The only difference in the dredge prism for these sites versus the sand bed reach is the addition of one ft. of required dredging depth, or a total of 49 ft. below the Columbia River Datum. This design allows for the channel depth at 43 ft., advanced maintenance depth and a minimum under keel clearance. The additional one ft. of dredging in the rock is required to allow future maintenance dredging to a depth of 48 ft. to be accomplished. Hydraulic cutterhead dredges will in fact disturb or loosen sediment to a one ft. depth below the actual depth of removal. This is due to the suction mouth position inside the cutterhead. If the rock surface is at 48 ft., and not at 49 to 50 ft. depth, the cutterhead dredge will not be able to remove maintenance sediment to the 48 ft. depth.

The suggested “Rock” dredge prism design is provided in Figure 2 below.

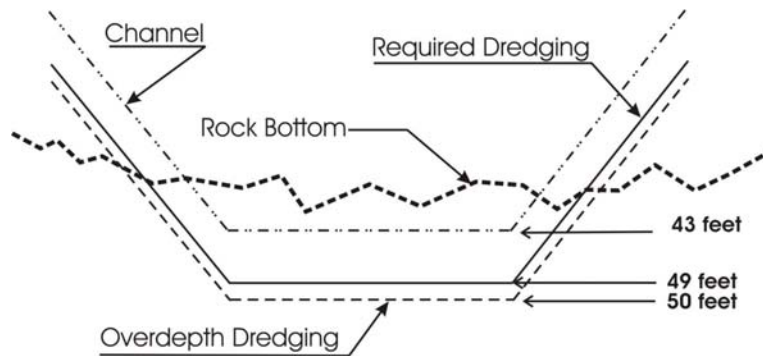


Figure 2
Dredge Prism for Rock Reaches

Production Rates

Once the required dredge volume and gross dredge volume were determined based upon the project templates, the next major factor to be considered was dredge production rates. This impacts dredging time and as a result the project cost. The analysis included examination of cycle times for each type of dredge and determination of the factors limiting production. For example, a cutterhead dredge's production can be limited by how much material the dredge can move through the suction pipe or by the horsepower requirements to transport the dredged material through the discharge line. The presence of a thin or small cut thickness could result in production as a function of the dredge's advance through the dredging area.

Production Rate Conclusions

In evaluating the reasonableness of the cost estimate dredge production rates, the following conclusions were made for cutterhead and hopper dredges:

1. Except for the rock dredging, the cutterhead and hopper dredges will be working in the Columbia River sand wave environment. These are mounds of sand on the bottom of the Columbia River which move downstream as a bed form called a sand wave. The grains of sand roll or bounce along the bed, up the flat slope of the sand mound, over the top of the mound and down the steep face of the mound into the deeper water that exists between the mounds, or sand wave peaks. This erosion from the upstream side of the sand wave, transport and then deposition on the downstream face of the sand wave does occur at depths deeper than the proposed new channel depths. As a result the bed material to be dredged is loose silty sand sediment to depths of 50 to 55 ft. CRD. It should be noted that these sand waves are literally hundreds of ft. long from trough to peak.
2. Due to the characteristics of Columbia River sand waves, the dredge cuts would behave more as maintenance dredging cuts. This is particularly true in the reaches with shallow cuts less than 6 to 10 ft. thick. The loose, mixed nature of the silty sand sediment will allow the dredge material to flow to the dredge plant and not behave as the more dense, consolidated material characteristic of new work virgin cuts.

3. The survey data and volume calculations were accurate.

Cost Adjustment Factors

Cost Estimate: Hopper Dredge Section

In evaluating the reasonableness of hopper dredge production, the panelists' concluded that the height of the dredge face would not affect hopper dredge production rates. The results of the analysis, which included review of recent hopper dredge bid abstracts for the Columbia River and the Cost Engineering Dredge Estimate Program (CEDEP) cost analysis, are as follows:

1. The Corps hopper dredge unit costs derived in the channel deepening cost estimate are consistent with recent hopper dredge bids for Columbia River work. As "new work" dredging is similar in nature to maintenance work and is in similar areas, this is a reasonable indication of the competitive market for the Columbia River Improvement work.
2. The 5% increase in dredge time for new work used in the Corps estimate is too conservative and is not reasonable. As discussed previously, the "new work" dredging will behave like maintenance dredging material. There will not be a need to continually return to clean the dredged area due to gradual slope failure of the dredge cut. Slope adjustment will be ongoing with the increase in dredged depth.
3. In the CEDEP input there appears to be inconsistencies in the data entry. For example, the gross and net yardage figures for several of the dredge reaches are inconsistent, or the calculations for total dredging volume are incorrect.
4. Particularly in the few deeper cut reaches (8-10 ft. or thicker) it may be more appropriate to calculate the overdepth dredging based upon the cut thickness below the maximum required dredging. This site specific calculation would be preferred over the approach to add cost as a fixed percentage of the total dredge quantity.

Cost Estimate: Cutterhead Dredge Section

In evaluating the reasonableness of the cutterhead dredge production rates, the following conclusions were made:

- The cutterhead dredge would make 300-ft swings to dredge the material. This swing width will dredge half of the channel at a time, which will reduce the potential for interference with vessel traffic on the river.
- The dredging cuts in the CEDEP accurately reflect the average dredge cut thickness.
- The 30" cutterhead dredge, used in the cost estimate, is a reasonable choice, based upon channel conditions and disposal requirements and expected equipment availability.

The results of the analysis are as follows:

1. Based upon analysis of the CEDEP input information, approximately 67% of the cutterhead dredge cut faces were small, under four ft. For a 30" cutterhead dredge with a 10-ft diameter cutterhead, this is a very thin cut. Based upon the dredging experience of the cost review panelists, these reaches are limited by the dredge advance rate rather than the pumping rate as developed in the CEDEP calculation. As a result, the Corps production rates in these reaches are not optimistic enough for these thin cuts.

Based upon the CEDEP information in the cost estimate, CRM 74-75 is used as an example for calculating cutterhead production based upon advance rate. CEDEP information on this reach of the river provides the following data:

- Two (2) ft. dredging face
- 1,400,000 ft² dredging area
- 104,229 cy gross dredging volume

In determining a reasonable production based upon advance rate, a 50 ft/hr dredge advance rate was used. This is a reasonable rate for a 30" cutterhead dredge based upon general experience and not specific to the Columbia River. The following calculations derive a dredge production rate based on the dredging reach length, dredging area and channel width.

$$\frac{1,400,000 \text{ ft}^2}{600 \text{ ft}} = 2,333 \text{ ft}$$

Since the dredge swing width is 300 ft (1/2 the 600 ft. channel width) the dredging reach length is doubled to 4,666 ft and then the dredge production is calculated based upon dredge advance rate and the gross dredging volume.

$$\frac{104,229 \text{ cy} / \text{hr}}{4,666 \text{ ft}} (50 \text{ ft} / \text{hr}) = 1,116 \text{ cy} / \text{hr}$$

Therefore, it appears that CEDEP is not reasonably addressing the cutterhead production in thin cut areas with a value of 646 cy/hr derived for CRM74-75 versus 1,116 cy/hr based upon an advance rate of 50 ft./hr.

2. The larger faces, greater than 10 ft., appear to be reasonable when compared to DRDGRATE, a proprietary dredge production program of DOF Inc. The dredge production program was available to the panel and was used for this comparison.
3. The intermediate dredging faces, 4 to 10 ft., require further analysis to determine if advance rate or pump rate control production.

Disposal Areas

The results of the analysis of the disposal area cost items are as follows:

1. The design considerations of the Corps cost estimate appear reasonable and complete based on the methodology (location and type).
2. Appropriate cost elements were included in the Corps estimate, such as disposal area clearing, dike construction, overflow weirs, return pumps, etc.
3. Adequate to conservatively high crew sizes were included in the estimate.
4. Appropriate equipment sizes and numbers were included in the estimate.

Mobilization and Demobilization

The mobilization and demobilization analysis included panelists' knowledge of existing suitable contractor equipment, their present location in the USA, the number of pieces of equipment being mobilized for hopper dredges, cutterhead dredges and drill barges, and typical contractor demobilization practices. The results of the analysis are as follows:

1. A proportional distribution of mobilization and demobilization costs based upon new work and Operations and Maintenance dredge volume is reasonable.
2. A West Coast (So. California) mobilization for equipment is reasonable.
3. The cost to secure and berth the dredge until the next contract award to the contractor is acceptable for a cost estimate of demobilization.
4. The mobilization of two drill barges is reasonable. As this is a relatively high mobilization cost for the project, additional evaluation of the drill barge and rock removal activity was completed.

There is a large work load on the East Coast for drill barge equipment, which is expected to continue for the next several years. There are also a limited number of these barges available in the USA. As a result, it is very probable that only one drill barge will mobilize for this project. If a new drill barge is not constructed on the West Coast, this work should be extended over two years. In that event, a competitive bid for a single drill barge would be possible. The single barge would likely be demobilized back to East Coast due to the work load, and return the next drilling season. One barge for two years mobilization and demobilization is equivalent to two barges for one season.

The total drilling effort could be completed in one year by one barge if the drill barge rate is 5,000 to 6,000 ft² per day. Ongoing work in New York in diabase (granite) suggests this may be a reasonable rate.

5. The Panama Canal has a drill barge that may be available.

Adjustment Factors

Several adjustment factors were identified in the Narrative Document provided with the cost estimate, as follows:

1. Narrative 5.e.: Overdepth Quantities

It is reasonable the contractor will dredge all of the required depth plus pay overdepth. The contract should be developed to identify depth of dredging required for the project. An overdepth of one ft. should be used for hydraulic pipeline and mechanical dredge, but should not be identified as a pay item. (See Channel Design, above.)

It is reasonable to use a percentage of total net dredged as a volume of the hopper dredge overdepth dredging for the shallow cut areas. This should be based on recent records of hopper dredge experience as the work is very similar to maintenance dredging activities. (See Production Rates, Hooper Dredge, above.)

2. Narrative 7.f.: Quantities Along Channel Slope (Sand)

Slope sloughing for shallow cuts is not a factor with cutterhead dredging. Allowance for this as a percentage of the dredging volume is too conservative, and is not reasonable.

Slope sloughing for clamshell in rock dredging reaches of the river is not a factor. The use of these factors is too conservative and does not represent a realistic cost based on the conclusion that “new work” dredging is virtually the same as maintenance dredging at a deeper depth.

3. Narrative. 8.i.: Cleanup Factor

This factor is basically same as 7.f. If it were a prudent assumption, it would be double counted in the estimate. This is not a prudent assumption in shallow cuts or for clamshell operation in the rock areas. Again, the dredging is not typically “new work,” and is more like maintenance dredging. Using a required depth equal to the maximum pay depth in the contract, and assuring proper and continuous QA/QC for construction over-site, is suggested. If this is provided in construction management, clean up issues will not exist.

For deep bank cuts (greater than eight-ten ft.), a consideration for clean up cost may be appropriate, but should be based on engineering analysis using geotechnical characteristics of slope failure and length of applicable reach, with a different value for different cut heights. The panel suggested not to use a percentage as the basis, as it will not be representative of existing conditions.

4. Narrative. 11: Hopper Dredging

A 5% increase in time is assumed for “new work” by the hopper dredges. Again, the project is virtually a maintenance dredging effort and additional time for new work is a very conservative assumption. Existing cost for maintenance dredging is an excellent basis for the hopper dredge cost estimate, without any time increase.

Response to the NOAA/NMFS Report

The NOAA/NMFS Report was submitted to the cost panel on Tuesday afternoon, August 6. The Report covered several items relative to the channel deepening of the Columbia River. The issues raised in the correspondence included environmental impacts related to channel deepening, salinity intrusion related to channel deepening, dredge material volumes estimated for future maintenance, and non-structural alternatives. The salinity intrusion, sedimentation rates, and endangered species impacts included in the Report were beyond the scope of the panel's review.

The maintenance dredging volumes were reviewed and addressed by the cost panelists. It is suggested that the Corps review their determination of future dredge volumes, and the corresponding data included in the NOAA/NMFS correspondence. It is suggested that a reasonable estimate of future maintenance volumes should be based on average historic sedimentation rates for existing maintenance and existing dam river flood control.

A non-structural alternative also was addressed by the cost panelists. Based upon the presentation on Wednesday August 7 by the Pilots and the Port, the cost panelists determined that the Loadmax system and the vessel movements do fully utilize opportunities for maximum water depth. Loadmax does provide highly accurate monitoring of river levels and the vessel traffic system is fully exploited to the point allowed by the available data. The limitations to improving depth elevation predictions are due to Bonneville dam releases and weather forecasting, not the capabilities of Loadmax.

Closing Comments

The scope of work for the cost review focused only on review of the Corps' cost estimate. The amount of information provided, and the time for review, required the cost panelists to set up a preliminary review and a secondary detailed review of items of concern as explained above. The final comments provided by panelists also apply to the cost estimates in the sponsors' plan, although the panel did not specifically review the cost estimates in the sponsors' plan.

Q&A Session with Cost Panelists

Following the presentation of the panelists responded to questions from the Corps and the public. In response to a question, the cost panelists indicated the conclusion that the Corps' dredge production rates were too conservative was based on the data they reviewed for dredge cuts in the two to four ft. range. The panelists noted that the Corps estimates for intermediate cuts (in the four to ten ft. range) seemed more realistic, though worthy of closer scrutiny.

The panelists were asked about the extent to which they believed that the Loadmax forecasting system was being fully exploited to indicate when deep draft vessels could

make the passage through the Columbia River Channel. The panelists stated that they had received a thorough briefing on the Loadmax system and had discussed the use of that system with a Columbia River pilot. Based on this briefing they concluded that Loadmax was already being pushed to its limits and that a deeper channel would be needed before deeper draft vessels could navigate the channel.

The panelists stated that their production rate was based on a 300 ft. wide sweep of the channel by a cutterhead dredge. Because the channel is at least 600 ft., this sweep width leaves half the channel width open to vessel traffic at all times.

The panelists also explained that they did not calculate a unit price for the dredge plan. Rather, they calculated the total volume and production rate change and found that an increased production rate should reduce time needed to complete the project and therefore reduce production costs.

The panelists also reiterated that they did not evaluate any aspect of the sponsors' plan nor did they develop estimates for the disposal, monitoring or mitigation costs of dredged material; however, the panelists did briefly review the Lois Island and Miller Sands, Pillar Rock sites. A Corps official stated that the environmental restoration aspects of the project were secondary to the cost analysis conducted by the panelists.

Results of the Benefits Panelists' Review

Introduction

On Friday, August 9 the benefits panel presented a summary of the results of their review in a public meeting. The following discussion of the results includes the summary material presented at the meeting, as supplemented and described in greater detail by the benefits panelists in the preparation of this report.

Review Approach

As stated previously, the mandate for the benefits review panel was to evaluate

- whether the assumptions, methodology, interpretations of analysis, and conclusions based on the Corps's analysis of the potential economic benefits of the 43' channel were reasonable, and
- whether data were used properly in the overall analysis by the Corps.

Based upon the panelists' review of advance resource materials provided by the Corps in advance of the review (see Attachment C for a list of the materials), and the presentations on Monday, August 5, the benefits panel undertook the following approach during the working sessions on August 6-8:

1. Panelists identified the major categories of potential shipping benefits attributable to container vessels and attributable to bulk vessels.
2. For each category of benefits, the panelists identified the key issues of concern, and then ranked them (high, medium, low, zero) according to their significance to

the Corps's benefits analysis. The panelists also focused generally on the Corps's benefits methodology.

3. The panelists identified and requested additional data and information, which are listed on Attachment C.
4. The panelists requested and received a briefing from Brian Shenk on Wednesday, August 7 about the delay calculations, the assumption that Portland volume is constrained by capacity, whether vessels currently are taking advantage of all movements possible with the Loadmax river level forecasting system, whether Corps assumed there would be freight rate reductions to US shippers, the rationale for fleet size assumptions, the assumption that Handymax vessels are coming back empty, the rationale for choosing the minimum growth for grain projections, the least total vessel cost size, with or without the project, and Seattle/Tacoma Panamax vessel top-off options. Mr. Shenk also was asked to, and did, identify where to find vessel data (e.g. design draft, departure draft, loading, delay time in departing, etc.) in the Corps's spreadsheets.
5. The panelists also requested and received a briefing on Wednesday, August 7 on the Loadmax forecasting system, which is described above.
6. The panelists worked through all of the key issues.
7. The panelists developed a joint presentation for the Friday, August 9 session.

Corps's Channel-Improvement Benefits Methodology

The Corps's methodology for determining potential economic benefits from the 43 ft. channel defines benefits as the in-transit and delay transportation cost savings associated with the improvement. Dredging a shipping channel to a deeper depth will allow shipping lines to utilize larger vessels, and to load additional cargo on existing vessels limited by channel depth. Because vessels exhibit economies of scale at sea:

- A fully loaded larger vessel will incur a lower cost per ton of cargo transported than a fully loaded smaller vessel.
- A fully loaded vessel of any size will yield a lower cost per ton than a partially loaded vessel of the same size.

The vessel cost savings to shipping lines in using larger versus smaller vessels or increasing the utilization of existing vessels to transport a given amount of cargo from the channel port to the cargo's destination port are potential transit transportation benefits from the channel improvement.

To obtain the actual transit transportation benefits associated with the channel improvement, one or more adjustments will have to be made to the above potential benefits.

- First, vessels that are not constrained by the water depth of the current channel ("without project") will not benefit from the channel deepening ("with project"). Thus, there are no potential benefits from dredging for these vessels.
- Second, if the channel port is a vessel's last port of call along a coastal region, then all the cargo on the vessel (from the channel port and from other ports along the

coast) could benefit from the channel deepening, i.e., from shipping lines shifting some or all of the vessel cost savings forward to shippers in the form of reduced rates.

- Third, if the channel port is a mid-port of call along a coastal region, then the potential benefits would only exist if succeeding ports were cargo constrained but not draft constrained.

The Corps' analysis appropriately considers the impact of a port as a mid-port and last port of call.

Transit transportation benefits may also come from inland transportation cost savings. Suppose vessel capacity supplied by shipping lines to the channel port is constrained by the current depth of the channel (without improvement) which, in turn, constrains the amount of cargo that can move through the port. A deepening of the channel will allow for an increase in vessel capacity and therefore the amount of cargo that can pass through the port. Hence, some cargo that would have moved through a more distant port may now experience a reduction in inland transportation costs by moving through a less distant port. The inland transportation cost savings incurred by this cargo represent additional in-transit transportation benefits from the channel deepening. However, if the use of larger vessels or increased loading of existing vessels in the with-improvement channel results in a decrease in the number of vessel calls at the port (i.e., a decrease in frequency of service), some of the former additional (containerized) cargo may remain with the more distant port, thus reducing the inland transportation cost savings from the channel improvement. Establishing the amount of shift and the benefits from inland cost reduction would require an analysis of the multiple factors behind shipper routing practices and the impact of changing a single factor – vessel capacity – on the result.

Deep-draft vessels using the “without project” channel may delay their departure times to coincide with higher water depths from seasonal inland run-off or daily tide cycles. If so, their costs in port will increase by the vessel costs associated with delayed departure times. However, for the “with project” (deeper) channel, their delay departure times will be less. The delay departure vessel costs for the “without project” channel minus the delay departure vessel costs for the “with project” channel represent the delay transportation cost savings, or the delay transportation benefits, for the with-improvement channel. A determination of the delay cost reductions attributable to channel deepening would require an initial analysis of past delays and the reasons for those delays, and a forward-looking analysis to determine which and how much of the delays would be eliminated through channel deepening.

Container Vessel Benefits

Overview

The Corps's analysis of potential benefits to container shipping from channel deepening focused on transportation cost savings through greater vessel utilization achieved

through increased departure depths. Within the NED benefits analysis the benefits review panel members raised three major issues:

- Inclusion of benefits to "light loaded" vessels that did not use the available channel depth.
- The lack of a "multi-port analysis" to capture the full range of potential benefits and verify that estimated benefits could be achieved in the complex world of container shipping.
- Insufficient documentation and risk/sensitivity analyses.

Much of the Corps's container shipping analysis appears reasonable:

- In many cases the Corps adopted conservative assumptions.
- Overall, the Corps used data properly.
- The exclusion of Canadian and intermodal container cargo from the benefits analysis was appropriate.
- The Corps's interpretation of their analysis is generally reasonable, although the scope and methodology issues identified by panel members constrain the reliability and accuracy of the benefits estimate.

Although apparently reasonable at the time, the absence of a multi-port analysis is no longer reasonable in light of recent information.

- The Corps's analysis to date does not capture the complexity of the container shipping market or container vessel operations, or the role of Portland as a last-call, riverine port with generally lower value niche cargo exports.
- The Corps's analysis also does not consider alternative interpretations of current and historical cargo flows and routing decisions in determining the rate of cargo capture from the Portland hinterland.

The Corps's container shipping analysis and reports would benefit from fuller documentation and explanation of assumptions and methodologies.

- The Corps, the Port of Portland, and BTS/DRI-WEFA have three different approaches to container cargo capture and cargo forecasts, which could not be reconciled and are not supported by detailed documentation.
- The complexity of the issues and the number of important inter-related assumptions and judgments requires more extensive analysis of risk and uncertainty. The risk and uncertainties analysis for container vessels is incomplete, as it focuses on commodities and fleet composition, and does not analyze alternative container capture and growth rate assumptions as they affect the benefits.
- Corps's analysis could incorporate a more detailed understanding of maritime shipping.
- The Corps's analysis would have benefited from earlier external technical review of scope and methodology.

These issues are discussed below in their application to the major categories of container shipping benefits, listed in order of their significance.

Reduced container vessel operating costs for Portland (through greater departure depth and utilization) (high significance)

General Comments

The analysis of transportation cost savings for container shipping at the Port of Portland accounts for the great majority of potential project benefits, and is thus critical to the project overall. The panelists focused much of their attention on this issue and raised several key issues, including:

- Ocean carrier utilization of departure depth with and without project, and attribution of benefits to vessels that do not use the greater depth
- Achievement of savings by loading fewer vessels versus the potential impact of decreased frequency
- Assumption of no induced cargo growth versus independent cargo forecasts and allegations of unmet demand
- Uncertainty of long-term ocean carrier commitment or vessel deployment patterns
- Availability and benefits of non-structural alternatives

Assumptions

Lack of Cargo Impacts. The Corps assumed the same container cargo growth “with project” and “without project.” Panel members expect that cargo would increase faster with channel deepening, but a more detailed, multi-port analysis is needed to determine how much increased cargo would be induced by channel deepening. The BST/DRI-WEFA forecast expects containerized cargo to grow faster if the channel is deepened, yet the Corps’s analysis contains no demonstration of unmet demand.

Vessel Capacity Limits. There is a pervasive assumption in the Corps and Port studies that containerized cargo growth at Portland is limited only by vessel capacity. This assumption is not substantiated. Panel members noted that shipper port choice factors are typically far more complex, taking vessel schedules, rates, terminal conditions, and overall supply chain logistics into account. The HDR Engineering report on inland costs (page 4) mentions “...carrier preference, transit times, and overseas port requirements..” as additional factors.

Container Fleet Assumptions. The container shipping benefits analysis assumes that the composition of the containership fleet calling Portland will not change with channel deepening. In other words, the same vessels with the same capacities and design drafts will call Portland with or without deepening. Panel members felt that there could be some tendency to use larger vessels if a deeper channel were available, and that there could be some undocumented potential benefits. The Corps assumption that the container fleet changes are the same “with project” and “without project” appears reasonable and conservative within existing Corps analysis. Panel members believe

this issue should be analyzed as part of a broader, multi-port context, and subjected to thorough sensitivity analysis.

Loaded vs. Empty Container Traffic. The Corps assumed that loaded and empty container traffic would grow in parallel, retaining the existing proportions on Portland vessels. It is almost certain that the ratio of empties to loads would change, but the extent to which it would change and the impact on the benefits estimate is unclear. Should the carriers decide to use additional vessel cube (space) capacity to reposition a higher proportion of empty containers to Asia, the benefits (based on vessel sailing draft) may be smaller than if the increased vessel utilization based on sailing draft were attributable to loaded containers. At a minimum, this assumption, as well as the designation of “full vessels” based on sailing draft and or cargo space needs to be verified and the sensitivity of the benefits analysis to changes in the ratio of loaded and empty containers needs to be tested. This is another potential application of the multi-port analysis.

Carrier Market Entry and Exit. The Corps assumed that the supply of container vessel capacity was limited only by channel depth, ignoring potential carrier entry and exit calling directly at Portland. While this may be reasonable under standard NED analysis guidelines, this approach creates an incomplete picture. Individual ocean carriers and carrier alliances have repeatedly entered and exited the direct Portland market over the last two decades. At the time of the review, one major carrier (Evergreen) had recently exited, leaving two alliances serving Portland directly and other carriers serving the same market indirectly over Tacoma or Seattle. Another carrier alliance was expected to begin direct Portland calls in August of 2002. The estimate of transportation cost savings rests on increased utilization of a fixed fleet of vessels calling Portland. Entry of another carrier with additional direct calls that spread the available cargo among more vessels could theoretically negate most of the benefits assuming that the cargo volume is fixed. The existing analysis does not capture this level of complexity.

Methodology

Service Implications of Fewer Vessel Calls. Since it was assumed that neither the cargo volume nor the vessel fleet would change with channel deepening, the transportation cost reductions would necessarily come from greater utilization of existing vessel capacity and fewer vessel calls. Vessel frequency, however, is a major factor in the decision of shippers to route cargo through a given port. Other things being equal, reduced vessel calls would tend to shift cargo to other ports. The realism of the post-deepening vessel scenarios must therefore be more closely examined (leading to a multi-port analysis).

Forecasts and Cargo Capture. The Corps's analysis apparently included simplifying assumptions regarding current and future container cargo capture from Portland's hinterland (equivalent to market share). These factors were incorporated as the BST/DRI-WEFA Port of Portland cargo forecasts were applied to the benefits analysis. Some of these factors appear to be judgmental, although the analysis tends to be

conservative. These critical judgments should be made explicit, documented, and subjected to explicit sensitivity and risk analyses.

Tons vs. TEU. As is standard practice, the Corps conducted its analysis of container shipping benefits in short tons. The decisions made by shippers, consignees, and vessel operators are more often made and expressed in TEU (twenty-ft. equivalent units) or container count. The Corps thus applied a cargo weight standard to vessels that are managed by cubic capacity, which may give a distorted picture of vessel capacity utilization. This practice may also obscure the handling of empty containers, which have a tare weight but not net shipment weight. There may be merit in a parallel analysis expressed in TEU.

Vessel Costs. The analysis used information from the Institute of Water Resources (IWR) to estimate container vessel operating costs in port and while sailing for various vessel sizes. Use of IWR vessel costs appears reasonable and consistent with Corps practices.

Light-Loading Vessel Benefits. Current practice at Portland is for container vessels to depart with drafts of 38-39 ft. Vessels departing at shallower departure drafts (e.g. 36-37 ft.) are referred to as “light-loading” in the absence of cube capacity constraints, as they are not carrying as much tonnage as the present 40-ft. channel would allow. The methodology for vessel cost savings includes benefits from “with project” departure drafts of 38 ft. or less, which is not reasonable. Such departure drafts are available at present, and do not require deepening. Moreover, light-loading vessels using less than the available draft with or without the project are apparently limited by some factor other than channel depth. Benefits would only accrue to vessels now limited by channel depth, those now leaving at departure drafts of 38-39 ft. that could load to 40-42 ft. with deepening.

Conclusions

More Modest Container Shipping Benefits. The assumptions and methodologies described above tend to raise the estimate of transportation cost savings. In particular, the attribution of benefits to light-loading vessels increases the apparent cost savings. A revised analysis of similar scope would yield lower benefit estimates. A broader, multi-port analysis that captured the inland cost issues raised in the Port’s report may, however, reveal other categories of benefits.

Non-Structural Alternatives. As noted below, the Corps’s assessment of no further benefits from Loadmax appears reasonable.

Reduced container vessel operating costs for non-Portland cargo (medium significance)

General Comments

The Corps's analysis extended the benefits of improved container vessel utilization and lower unit operating costs to certain non-Portland cargo carried on Portland vessels. These benefits accounted for roughly one-third of the total container shipping benefits, and are thus of medium significance to the overall benefits analysis.

In general, this category of benefits is subject to all of the comments in the preceding section. Members of the benefits review panel cited two additional concerns.

Realization of Rate Reductions by Non-Portland Shippers. As noted elsewhere, the standard interpretation of NED benefits implicitly assumes that transportation cost reductions will result in benefits to US carriers or shippers. Given that the carriers in question are all foreign-owned, the validity of this implicit assumption rests on the translation of carrier cost savings into rate reductions for US customers. This is a particular concern when the NED analysis effectively assumes that carrier operating savings from greater Portland departure depths will result in rate reductions to shippers using *other* ports, specifically Tacoma (the last US port before Portland on outbound trips). More complete analysis (i.e. the "multi-port" analysis) would be required to support these benefits.

Impact of Rate Reductions at Other Ports on Portland Cargo Capture. If improved vessel economics do indeed benefit cargo and shippers at other ports, specifically Tacoma, what is the potential impact on cargo capture from Portland's hinterland? The Corps's analysis assumes no change in cargo flows due to the project, yet improved economics at a competing port such as Tacoma could tend to draw cargo away from Portland.

Reduced container vessel delay costs (low significance)

General Comments

The Corps's analysis attributes benefits (transportation cost savings) to the reduction of vessel departure delays otherwise due to insufficient water depth. The analysis uses the frequency of delays *potentially* due to water depth and the costs of the vessel in port to estimate the potential benefits. The total benefits attributed to delay reduction are only a small portion of the total benefits, and have limited significance in the overall benefits estimate.

Assumptions

Causes of Delay. The Corps's analysis effectively assumed that the relevant vessel delays were due only to water depth. This is inherently unlikely, as there are numerous other potential sources of delay in vessel and terminal operations. For example, if a

vessel is already delayed by two hours due to landside difficulties and has to wait two more hours for sufficient water depth, only two hours of the delay could be eliminated by deepening the channel. A more complete analysis is needed to attribute delays (and benefits of avoiding delays) to their proper causes.

Methodology

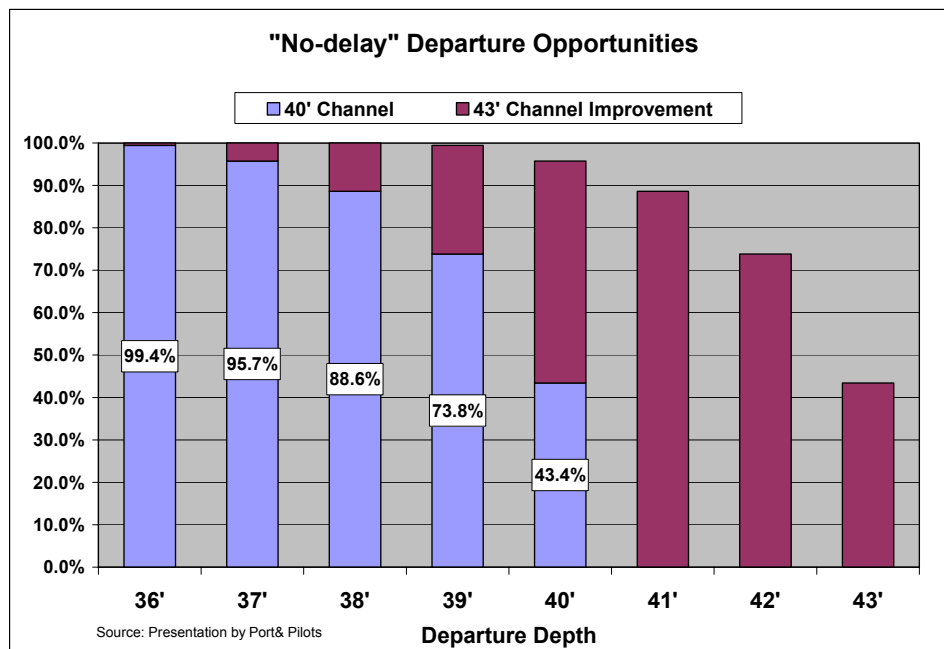
Documentation. The panelists thought that the information on the delay analysis presented in the Corps's Draft SIFR and SEIS (July 2002) was insufficiently detailed to create confidence in the estimate.

Impact of Labor Rules and Landside Factors. Members of the benefits review panel felt that the Corps did not pay sufficient attention to the role of labor rules and other landside factors in vessel delays or the net cost impact of delay reduction. In particular, the rigidities in labor rules for gang sizes and minimum shifts need to be considered to develop a complete picture of vessel delays and corresponding benefits of channel deepening.

Vessel Delay Cost Analysis. The analysis of vessel cost in port appears reasonable. The issue is whether the vessel costs are applicable to delays not caused by water depth, and what level of delay carriers find acceptable.

Departure Depth "Windows". The first data series in Exhibit 1 based on information presented by the Port of Portland and Columbia River Pilots, shows the percentage of time that vessels with given departure depths can depart without delays. At the common departure depths of 38-39 ft., vessels can depart between 88.6% and 73.8% of the time without delays in the existing 40-ft. channel. As these are the departure depths in common use, these departure "windows" are apparently acceptable to container vessel operators. The second data series shows the pro forma departure windows with a 43-ft. channel, effectively moving all the columns to the right by three places. The chart suggests that there would be very small increases in reliability (or decreases in delay) for vessels departing at less than 38 ft., and progressively larger improvements for vessels departing at 38-39 ft. The Corps's analysis did not appear to reflect this level of detail.

Exhibit 1



Non-Structural Alternatives. The benefits panel did not explore in detail the non-structural measures analyzed by the Corps. The panelists did look at Corps's analysis of the Loadmax system, which dismissed the possibility of further non-structural benefits from enhancements to Loadmax. The benefits review panelists initially felt the analysis was cursory and should be updated. However, based on the additional information and presentations on Loadmax, the panelists were convinced that the system is being used to its full potential.

Conclusions

Significance of Delay. Portland is currently the last port of call for vessels outbound to Japan on both alliance services. Given the transit times to Japan of more than a week, a delay of a few hours may have no practical significance. The report also notes that late vessel arrivals could disrupt schedules of connecting intermodal (rail/truck) operations, but such operations do not take place in Japan. While it is true that liner services attempt to adhere closely to scheduled arrivals, it is also true that a delay of a few hours can almost certainly be made up on the trans-pacific crossing. In these circumstances, the impact of a small delay may be no more than the added cost of fuel for a slightly accelerated vessel speed if the schedule is to be rigidly maintained on an hour basis.

Reduced inland cost through greater Portland container cargo capture (no significance to Corps, high significance to Port's analysis)

General Comments

The Port of Portland presented an analysis of inland transport costs and potential cargo capture from Portland's hinterland, the Container Transportation Benefit Study. The report concluded that channel deepening would result in a 50% increase in container cargo through Portland due to additional capture, and substantial benefits through decreased inland transport costs. Although this category of potential benefits was not - addressed in the Corps's analysis, the magnitude of the benefits claimed and the need to address these issues in a broader, multi-port NED analysis led the review panel members to examine the Port's analysis in some detail. Three major questions were posed:

- Why are customers moving cargo from Portland's hinterland (defined as the area in which Portland is the least cost option) through Tacoma or Seattle?
- Are the cargo increases and cost estimates in the Port's analysis reasonable?
- Which parties are currently paying the additional inland costs, and which parties would therefore benefit from Portland routings?

Assumptions

Incidence of Costs and Benefits. The Port's analysis did not determine which parties were actually incurring the inland costs for diverting cargo from Portland's hinterland to Tacoma or Seattle. The underlying HDR report notes that *"Where a competitive service exists in Portland, ocean carriers that do not call Portland often choose to compete for this cargo by offering the shipper a Portland bill of lading. As a result, the shipper benefits from Portland exactly as if the cargo was exported through Portland."* (page 15) Under these circumstances, the ocean carrier would pay the inland costs, or at least the difference between Portland and Tacoma drayage, and the customer is indifferent. The carrier may or may not discontinue this practice if the Portland channel is deepened. If so, the carrier would receive any cost savings, also raising the issue of NED versus non-NED benefits.

Data

Questionable Drayage Cost Estimates. The Port's analysis used transportation costs estimates from a 2000 study by HDR Engineering. The panel members reviewed a summary of this study and raised serious questions regarding the drayage cost estimates. HDR apparently obtained a combination of drayage quotes and tariffs, and supplemented this information with a drayage cost model.

- HDR added separate empty container repositioning costs, effectively doubling the drayage cost quotes. This is contrary to the panel members' best understanding of industry practices, in which a single price is quoted for positioning an empty container and draying the loaded container to the port.

- HDR apparently based some of its estimates on trucking company tariffs. Customers rarely pay tariff rates for any significant volume of traffic. Tariff rates are ordinarily a starting point for negotiations and discounts.
- HDR added a 10% fuel surcharge to all drayage costs without checking the realism of this step.
- In its model, HDR apparently applied average *laden* costs (e.g. \$1.55 per mile for “super chassis” drayage) to the *entire* laden and unladen trip. Average laden costs ordinarily include a margin for empty repositioning.
- All of these steps would drastically inflate the estimated drayage costs. Panel members familiar with trucking costs felt that the estimates were roughly double any realistic figure. It is questionable whether any party would incur costs of this magnitude to dray relatively low-valued cargo to a different port. These apparently inflated drayage estimates would lead the analysis to overstate the size of the Portland hinterland, overstate the potential cargo capture, and overstate the potential benefits.

Methodology

Inconsistent Use of Forecasts. The Corps’s benefits analysis and the Port’s analysis of inland cost savings both used cargo forecasts from the BTS/DRI-WEFA forecast commissioned by the Port. Panel members received a summary of this forecast and a presentation by Paul Sorenson of BST. The forecast itself appeared reasonable and raised no serious questions among panel members. The use of the forecasts by the Corps and the Port, however, was markedly inconsistent:

- The Corps’s analysis assumed no additional container cargo growth attributable to the channel deepening, a very conservative approach.
- The Port’s study presentation claimed a 55% increase in 2020 export container cargo (from 2.0 million to 3.1 million short tons) due to the project.
- The panel members could not reconcile these approaches as part of the review.

Conclusions

Reasonableness. The panelists concluded that the Port’s analysis did *not* appear reasonable as presented. The analysis of in-land container transportation benefits contains data and assumptions that need to be verified, studied, and analyzed from the perspective of least total cost. There are serious concerns about the methodology and resulting transportation rates in the underlying HDR study, the treatment of cargo capture concept, the treatment of vessel costs, and distribution of benefits. This is a category of benefits, however, that should be considered in a broader multi-port study scope to determine NED benefits.

Bulk Vessel Benefits

Overview

Bulk vessel benefits from navigation improvements usually entail efficiencies for existing vessels in the form of greater utilization (cargo) and/or lower tidal-related sailing delays. In addition to the extent that navigation improvements allow for larger vessels to be efficiently used in place of smaller vessels there will be shipping cost savings that reflect economies of scale in vessel size. The panel ranked these benefits of medium significance to the Corps's analysis.

The major issues in bulk vessel benefits are typically the extent of increased utilization of existing vessels versus the replacement of existing vessels with larger vessels. The increased use of existing vessels is a function of capacity at origin and destination ports, including channel and berth depths, cargo handling, storage, and land transport. Where there are constraints in the bulk cargo logistics system that would prevent increased shipment sizes for the existing vessel fleet, the affected fleet should be excluded from navigation benefits. Otherwise in the absence of cargo constraints, most bulk fleets will maximize their loads and sailing draft consistent with local operating practices such as under keel clearance and related issues such as tide riding.

Typically the most controversial bulk fleet benefits are the result of projected increases in vessel sizes relative to cargo capacity for the "without project" and "with project" conditions. First, for many bulk trades a long-term pattern can be observed in the gradual increase of average size (deadweight tones of capacity) as well as the distribution of vessel sizes around the average. The evidence in a "fleet shift" to larger sizes of vessels is usually a time series phenomenon. The time series often reflects the age pattern of the fleet with older smaller vessels being replaced by newer larger vessels. The fleet shift can also reflect changes in world port constraints, including cargo volumes and markets.

There is a second possible "fleet shift" that may occur with navigation improvements associated with channel deepening. The expected rate of change in the size distribution of the fleet may accelerate in response to the opportunity to use larger more efficient vessels as a result of channel deepening in the absence of port constraints. The "with project" fleet shift can reflect a combination of increased sizes of vessels and/or an accelerated rate of fleet shift to larger vessels that occurs in conjunction with a deeper channel. Both developments produce lower vessel average total costs and NED benefits.

Conclusions

The potential Columbia River deepening benefits from the existing bulk fleet due to increased utilization and/or reduced delay were reviewed and appear reasonable. The potential Columbia River deepening benefits from the fleet shift to larger bulk vessels under with project conditions (deepening) were reviewed and also appear reasonable. There is a minor concern that the cost of bulk vessel trips should be reviewed as it

relates to assumptions about the empty return of these vessels instead of securing other loaded movements in conjunction with repositioning of the vessel for subsequent bulk shipments.

The bulk vessel benefits from increased utilization, reduced delay and larger vessels all appear to be reasonable in conjunction with conservative cargo projections which did not allow for the potential for increased cargo under with project conditions.

Cargo Projections Evaluation

Overview

A detailed review of the revised cargo projections presented by the Corps was supplemented by additional information provided by Paul Sorenson of BST Associates, attempting to detail the potential elasticity of port demand relative to any cargo cost/rate changes occasioned by the channel deepening project.

General Comments

Overall, the different product projections were deemed reasonable and the data used were properly compiled and extracted, as least as could be determined in this review process. The overall approach of utilizing the market growth/demand in international areas, constrained by the potential supply/production within the United States, produces estimates that seem appropriate. (The comparison to United States Department of Agriculture (USDA) projections, as done in the presentation on August 5, was not very helpful because these estimates are often considered overly optimistic by researchers and practitioners in the agricultural trade industry. The USDA estimates are not explained and are not used as a productive comparison.)

The overall description of the future size and design depth composition of the tramp ships serving the grain trade is acceptable and appears reasonable. The description of the rationale for the projected ship fleet composition seems complete.

Methodology and Assumptions

Data on the seasonality of the grain movements out of the ports of the Lower Columbia were presented for 1988 - 2001. These cargo movements were similar to other studies that have been done on world trade and information developed by the benefits review panel members over the years, especially for wheat, corn and barley movements on the river. The other studies show similar movement patterns. The seasonality is of particular note because the peak volume movements on the river happen to be at the times of the lowest water availability in the river basin.

The projections were derived by utilizing the DRI-WEFA projections of net trade by major importing and exporting regions. BST Associates then estimated the Pacific Northwest market share of the expected USA exports, followed by an estimate of the share of those exports that would be captured by the lower Columbia River ports and

elevators. Total transportation costs were used to allocate some of the major movements, adding to the volume of cargo moving towards these Columbia ports as a result of shifts from the Gulf ports and, to some degree, from the Puget Sound ports. This latter movement was mainly based on the larger vessel size that could come into the Columbia ports as a result of the channel deepening project. The analysis of the Gulf versus PNW ports contained conventional information that aided the discussion of the difference between the port areas and why some movement could be expected.

It should be noted that BST prepared “with and without project” deepening forecasts but the Corps only used the “without project” forecast in the revision that the benefits panel examined and evaluated. This assumption, accompanied by the lack of a spatial equilibrium model of domestic grain flows, may have resulted in an underestimate of benefits in this area.

Conclusions

The benefits panelists evaluated individual commodity projections, contained in the presentation to the panel on Monday, August 5, and in the supporting materials. The projections of exports seem reasonable for commodities of wheat and barley, with a low forecast of -0.2% annual growth to a high of 1.3% annual growth. Similar estimates were provided for sorghum, soybeans, and corn. In short, the estimates, though not statistically derived, were reasonable and believable.

As indicated earlier in this report, the fleet size projections were appropriately based on the identifiable trends in the bulk carrier segment of the ocean carrier industry. Shipment size has been steadily increasing and there is no reason to expect a shift away from this trend. However, it is critical that the analysis does not claim benefits for vessels that are currently serving the Columbia ports or would be available in the future to participate “with or without” the channel deepening project.

The elasticity estimates suggest a cargo increase response to the lower shipping costs of the channel deepened system; while not econometrically nor rigorously developed, they do reflect conventional understanding of the potential shifts among port areas given any decrease or increase in relative costs of shipping. The work by Fuller, *et. al.*, on the impacts of a toll at the Panama Canal is also supportive of the results in this study. However, once again, this work would have gained substantially by a fuller multi-port or spatial equilibrium analysis.

Finally, the Corps’ vessel costing model does include economies of utilization and economies of scale. This, combined with the description of the Handymax and Panamax vessel composition in the future, produces reasonable estimates of the benefits due to cargo growth.

Other Benefits Analyses

Scope of Existing Analysis. The Corps's analysis has a fairly narrow scope within the confines of NED principles and guidelines. The circumstances of this project led the benefits panel members to conclude that the analysis would benefit from a broader scope within the NED rubric. The panelists also discussed issues beyond the traditional scope of NED analysis.

Broader NED Analysis. A broader NED analysis would be appropriate. As noted in the summary of review comments on the benefits report, in several places the Corps's analysis does not address the full complexity of the container shipping industry or the particular circumstances of the Port of Portland.

The scope of a broader analysis would encompass the complexity of the container shipping market and container vessel operations, and the role of Portland as a last-call, riverine port with niche export cargo. A broader scope would also consider additional issues, including but not limited to:

- alternative interpretations of current and historical cargo flows and routing decisions in determining percentages of cargo captured from the Portland hinterland with and without the project;
- the perspectives of hinterland shippers and consignees on assumptions and forecasts;
- the views of shipping lines that do *not* presently call Portland on vessel operations and fleet composition scenarios;
- the perspectives of competing ports and the impact and extent of their expansion or improvement plans;
- the history of vessel delays and their underlying causes;
- past and projected ratios of empty and loaded outbound containers;
- the full logistics costs for container vessels, including potential in-port vessel size diseconomies, instead of relying solely on sailing and in-port transportation costs; and
- a trade flow/multi-port analysis for bulk commodities, which would include cargo handling and storage capacities, which may reveal additional benefits.

Potential inland container transportation benefits should be considered in a broader multi-port study scope. The Port's analysis of this issue contains data and assumptions that need to be vetted, studied, and tested from a least total cost perspective. There are serious concerns about the methodology and resulting transportation rates in the underlying HDR study, the treatment of the cargo capture concept, the treatment of vessel costs, and the distribution of benefits. A broader, multi-port analysis may be an appropriate means of re-addressing this issue.

Beyond the NED Analysis. Beyond the standard NED analysis, the panelists had concerns about the distribution of benefits between foreign lines and US shippers. Individual panel members recognized that Corps analyses have always culminated in the estimate of transportation cost savings and have not delved into the final distribution

of benefits between vessel operators and customers. The principles of NED analysis implicitly assume that transportation cost savings will contribute to US economic development. This assumption requires that transportation cost savings accrue to US carriers, or are passed on as shipping cost reductions to US shippers, US consignees, or other US entities.

The Corps is under no compulsion to address the distribution of transportation cost savings, and the Portland office does not have control over this policy. Accordingly, the panel members do not fault the authors of the analysis for focusing exclusively on transportation cost savings.

In this case, however, all of the container shipping lines serving Portland or likely to serve Portland are foreign. In the existing analysis, there is no demonstration regarding the portion of cost savings for foreign ocean carriers that would result in benefits to US customers under the current and expected commercial context.

The realities of Portland's situation and elements of the analysis itself led panel members to question the validity of NED assumptions as applied to this project. The "with project" scenario may be more conducive to rate rigidity for container vessels, and less conducive to rate reductions for the container trade.

- Under conditions of excess capacity and intense competition, transportation costs savings are readily passed on as rate reductions, and rates are driven down to the lowest level consistent with financial survival of the carriers. This is exactly what has happened in the westbound transatlantic container trade of the past few years. Westbound rates are now so low that some container carriers have cut back sales efforts for the lowest-rated export cargo.
- The vast majority of the transportation cost savings from this project are attributed to higher container vessel utilization through deeper departure drafts. Yet higher vessel utilization ordinarily results in rate rigidity, not rate cuts. Carriers are less likely to compete aggressively for export cargo when vessels are at or near capacity. This is especially true for the low-rated niche or "swing" cargoes such as the animal feeds and waste paper prevalent at Portland.
- Benefits to "additional tons onboard" from other ports are even more difficult to translate into expected rate cuts for US shippers. The possibility of carriers offering rate reductions to Tacoma export shippers due to increased departure draft and outbound utilization at Portland seems remote. Moreover, lower rates at Tacoma would hamper Portland's efforts to capture more cargo from its hinterland.
- Many of the inland costs associated with container cargo capture by other ports are apparently paid by foreign shipping lines, not by the US shippers. The HDR cost study notes: "Ocean carriers attempting to serve shippers in the Portland capture region through these alternate ports must equalize inland transportation costs to compete with ocean carriers calling Portland directly. Seattle and Tacoma ocean carriers typically accomplish this equalization through a variety of pricing

mechanisms, typically by accepting cargo in Portland and absorbing the cost of drayage to the Puget Sound“(page 5). If Portland “captures” this cargo due to channel deepening, the savings in inland costs will accrue to the carriers, not to the shippers.

In this “with project” scenario, it seems most likely that the carriers would attempt to retain any cost savings and minimize any rate reductions to US shippers or consignees. To estimate the actual national economic development benefits accruing to the US shipper, additional analysis would therefore be required.

Closing Comments

The benefits panel addressed the question presented by someone in the audience on Monday, August 5. The question posed to the benefits panel was:

According to the BST/USACE analysis the project benefits under a general scenario would be 19% greater than under current conditions. If the project was not undertaken are these benefits lost to the region or absorbed in the “National Economic Benefit” to other regional ports (Seattle/Oakland)?

A panelist pointed out that the increase in tonnage is not contained in Corps’ analysis. The reference is to a note in Paul Sorenson’s presentation slides from Monday August 5. This was a reference to an increase in tonnage, not an increase in benefits. There are no benefits claimed now that would be lost, as there would not be a 19% subtraction from the existing estimate, although it is accurate to say that cargo would stay at other ports.

The benefits panelists also acknowledged and thanked the Corps and Port personnel for their responsiveness to requests for additional information and documents throughout the week.

The benefits panel also suggested that the complexity of issues and number of important inter-related assumptions and judgments requires more extensive analysis of risk and uncertainty. Finally, the Corps’ analysis and reports would benefit from fuller documentation and explanation of assumptions and methodologies, incorporation of a more detailed understanding of maritime shipping, and earlier external technical review of scope and methodology.

Friday Q&A Session with Benefits Panelists

Following the benefits panel presentation on Friday, August 9, representatives from Corps and the Port of Portland, as well as members of the audience asked panel members questions about the results of the review. The following is a summary of the responses.

Panelists indicated that inland riverine ports across the nation are losing business to coastal ports that can easily accommodate deep draft vessels and that deepening the

channel is unlikely to reverse that trend. The cost and time a vessel spends steaming up and back out the 106 miles of the river is an expense most carriers would rather avoid.

The panelists also stated that they believed the inland transportation model had overestimated the savings shippers would realize in sending their cargo via Portland rather than Seattle/Tacoma. The panelists suggested that in some cases these savings had been double counted by the Port of Portland's container benefits analysis.

Finally, the panelists stated their belief that delay costs incurred by vessels had been overstated in the benefits analysis and that the costs of upgrading the Port of Portland's dockside facilities might also have been underestimated in the benefits analysis.

Explanation of Disagreements Amongst Panel Members

Members of the cost panel indicated that no disagreements arose during their discussion on the Corps' dredging plan or other related issues.

Members of the benefits panel disagreed on only two points. The panel members did not disagree on the content of the Corps analysis, or on whether the analysis could be improved. The sole grounds of disagreement were whether or not specific analytic assumptions were reasonable within the scope of the existing analysis.

Vessel Capacity Limits on Cargo. The Corps effectively assumed that the growth of container cargo at Portland is limited only by vessel capacity.

- Two panel members felt that this assumption was reasonable in light of the policies and guidelines for Corps studies and their knowledge of past Corps practices.
- Two other panel members believe this assumption is not reasonable because the experience of those members and other studies available to the Corps indicate additional relevant factors in shipper port choice. These members did not accept past Corps practice as a valid reason for the assumption.

Sources of Container Vessel Delay. The Corps methodology did not account for sources of container vessel delay – such as land-side constraints – that were not related to water depth.

- Two panel members felt that this assumption was reasonable in light of the policies and guidelines for Corps studies and their knowledge of past Corps practices.
- Two other panel members believe this assumption is not reasonable because the experience of those members indicate additional relevant factors in vessel departure delay. These members did not accept past Corps practice as a valid reason for the assumption.

Open Questions and the Plan for Addressing Them

Neither panel had any questions that were not resolved during the working sessions.

Summary and Wrap Up

In conclusion, Mr. Fisher commended the panelists for their hard work and thanked the Corps and the Port for promptly furnishing the panelists with the data needed to conduct the cost and benefits analyses.

Mr. Fisher informed the audience that a summary report of the technical review would be available to the public before the close of the public comment period.

**COLUMBIA RIVER CHANNEL IMPROVEMENT PROJECT
TECHNICAL REVIEW OF REVISED BENEFIT AND COST ANALYSIS
August 5 – 9, 2002**

TECHNICAL REVIEW PANEL MEMBERS AND PARTICIPANTS

Benefits Panel

Ken Casavant, Washington State University, Pullman, Washington
Kevin Horn, AECOM Consulting Transportation Group
Daniel Smith, The Tioga Group, Inc.
Wayne Talley, Old Dominion University, Norfolk VA

Cost Panel

Nancy Case O'Bourke, Case O'Bourke Engineering, Inc., Miami, Florida
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RESOLVE Facilitation Team

Robert Fisher
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Pam Kylstra
Alyssa Ledesma

Presenters – Public Meetings

James Daly, Port of Portland
Jon Gornick, US Army Corps of Engineers, Portland District
Laura Hicks, US Army Corps of Engineers, Portland District
Al O'Connor, US Army Corps of Engineers, Portland District
Brian Shenk, US Army Corps of Engineers, Portland District
Paul Sorensen, BST Associates

Presenter to the Benefits Panel on August 7, 2002

Brian Shenk, US Army Corps of Engineers, Portland District

Presenters on Loadmax to both Panels on August 7, 2002

Ogden Beeman, Ogden Beeman and Associates, Inc.
Sebastian Degens, Port of Portland
Capt. Steve Brown, Columbia River Pilots

**COLUMBIA RIVER CHANNEL IMPROVEMENT PROJECT
TECHNICAL REVIEW OF REVISED BENEFIT AND COST ANALYSIS
Fifth Avenue Suites Hotel
506 S.W. Washington
Portland, Oregon 97204
866-861-9514**

August 5-9, 2002

Draft Agenda

Monday, August 5, 2002 – Public Session (8:30-5:30)

- 8:30 Welcome, Review Agenda, Meeting Ground Rules
- 8:45 Overview of the Technical Review Process
- Purpose
 - Scope of the Process
 - Outcome
 - How the Reviewers were Selected
 - How the Process will Work
- Robert Fisher, RESOLVE, Facilitator*
- 9:15 Introduction of Reviewers
- 9:30 Overview of the Revised Cost and Benefit Analysis
- Projected Benefits and Costs
 - Key Aspects of the Analysis
 - Differences Between Revised Analysis and 1999 Analysis
 - Panel Q & A (15 minutes)
- Presenter*
- *Laura Hicks, Project Manager, U.S. Army Corps of Engineers, Portland District*
- 10:15 Break
- 10:30 Presentation and Panel Discussion of the Costs
- Dredging and Disposal
 - Quantities (New Work and O & M)
 - Disposal Site Selection
 - O & M Dredging and Disposal
 - Overview of Costs
 - First Costs
 - Annualized Costs
 - Key Assumptions and Significance for Analysis
 - Q & A – Panel and Presenters (30 minutes)

Presenters

- *Jon Gornick, Civil Engineer, U.S. Army Corps of Engineers, Portland District*
- *Al O'Connor, Cost Engineer, U.S. Army Corps of Engineers, Portland District*

12:30

Lunch Break

1:15

Presentation and Panel Discussion of the Benefits

- Overview of Benefits
 - Projected Reductions in Transportation Operating Costs
 - Projected Reductions in Vessel Delay Costs
 - Commodity Forecasts
 - Fleet Forecasts
 - Vessel Operating Costs and Practices
- Key Assumptions and Significance for Analysis
- Risk and Uncertainty

Presenters

- *Brian Shenk, Economist, Economics Section Chief, U.S. Army Corps of Engineers, Portland District*
- *Paul Sorensen of BST Associates*
- Multi-Port Analysis

Presenter

- *James Daly, Senior Research Associate, Marine Research Department, Port of Portland*
- Q & A with the Presenters (30 minutes)

3:30

Break

3:45

Public Input on Technical Aspects of the Revised Analysis

5:00

Identify Additional Information, if any, Needed by Reviewers

5:15

Summary and Next Steps

5:30

Adjourn for the Day

Evening

Dinner for Reviewers

Tuesday – Thursday, August 6-8, 2002 – Working Sessions for Reviewers

**COLUMBIA RIVER CHANNEL IMPROVEMENT PROJECT
TECHNICAL REVIEW OF REVISED COST AND BENEFIT ANALYSIS**

LIST OF MATERIALS PROVIDED TO REVIEWERS

ADVANCE RESOURCE MATERIALS – COST PANEL

All materials were provided to the panelists by the Corps, Portland District

1. Cost Estimate for Columbia River Channel Improvement Project – Corps' Plan; USACE, August 2002
2. Cost Estimate for Columbia River Channel Improvement Project – Sponsors' Plan; USACE, August 2002
3. Draft Supplemental Integrated Feasibility Report and Environmental Impact Statement; Columbia River Channel Improvement Project; Volume II; USACE, July 2002
4. CD. Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement, Columbia & Lower Willamette River Federal Navigation Channel; Volumes I & II; USACE, Portland District; August 1999
5. Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement; Appendix A – Engineering; USACE, August 1999
6. ER1110-2-1302, EM1110-2-1304 Engineering and Design Civil Works Cost Engineering; USACE, March 1994
7. Civil Works Construction Cost Index System (CWCCIS), USACE; March 2002;
8. Columbia River Channel Deepening: Oregon – Washington; Feasibility Cost Sharing Agreement and Initial Project Management Plan; USACE; April 1994
9. Delaware River Deepening Project, Comprehensive Reanalysis Needed; United States General Accounting Office, Report to Congressional Requesters (GAO-02-604), June 2002.
10. Columbia River Channel Improvement Project Series of Articles, TV Stories, Editorials, Etc; No date
11. Newspaper clippings from The Oregonian newspaper:
 - "Digging Deeper (First of a three-part series): Port's quest to deepen Columbia built on flawed, outdated data;" March 3, 2002
 - "Digging Deeper (Second of a three-part series): Salmon pay for shipping benefits;" March 4, 2002
 - "Critics fault new dredging analysis;" March 4, 2002

COST PANEL -- REQUESTED/PROVIDED SUPPLEMENTAL MATERIALS

Materials Provided by the Corps

1. NY audit info for rock dredging (Micro Computer Aided Cost Engineering System printout and '97)
2. Columbia River eo-tech Report (hard classifications for sediment)

3. NY Harbor Info regarding deepening (classified)
4. NY Historical Dredging Records
5. Oregon Dredge Analysis
6. Coos Bay Audit Information – Sandstone and '96
7. Monitoring blasting rock
8. Fish Hazing
9. Clam Shell Dredge Info – work hours/down time, NY Kill Van Kull
10. LA Pipeline Information
11. IDR Dredge Owners of Operators List for 2002
12. Site Designs for Upland disposal, Columbia River Deepening Project by Ogden Beeman and Associates
13. Map of Columbia River Basin with Disposal sites and dredging areas
14. Channel Status Columbia River-mouth of the Columbia to Bonneville Dam Feb 2001
15. Recent Hopper Dredge costs Abstracts
16. Portland – Vancouver Harbor Information Package- Reservoir Regulation and Water Quality Section, March 1991
17. Plan view of the Columbia River dredging and disposal sites
18. Construction Equipment Ownership and Operating Expense Schedule, Region VIII, August 2001
19. Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement, Columbia and Lower Willamette River Federal Navigation Channel, August 1999
20. CEDEP Programs (CD)
21. Hopper Pipeline Mechanical Corps Plan
22. Portland – Vancouver Harbor Information Package,
23. Model to Calculate Equipment Rates, Wage Rates, (proprietary Excel spreadsheet)
24. Hopper, Pipeline and Mechanical Dredges; Corps' Plan (CD)
25. Phone call with Al O'Connor, regarding use of dredge booster for river mile 74/75
26. Phone call with Al O'Connor regarding hopper dredge cost estimates are based on dump travel distance from bar midpoint to deep water flow lane midpoint

Materials provided by Others

27. Oregon Dredge information, provided by Larry Patella to Greg Hartman by phone on August 6 (no ladder pump; pump is just below water line with ladder extension, can pump at 50', with slowed production rate)
28. NMFS Memorandum, December 6, 1999, regarding the Lower Columbia Channel Deepening Project from John Stein to Rick Applegate, including (i) presentation Slides Columbia River Sediment Supply and Dredging Volumes, 15 pages, Presented by David A. Jay, Department of Environmental Science and Engineering, Oregon Graduate Institute; and (ii) Summary Review of Corps Columbia River Channel Deepening Environmental Impact Statement Issued August 8, Dated November 12, 1999, by David A. Jay, Department of Environmental Science and Engineering, Oregon Graduate Institute
29. Phone call on August 7 with Jeff Walker, Contract Drilling and Blasting – Emery Gray

30. Hopper Dredge Estimate, phone call on August 7 with Bob Perry, – U.S. Army Corps of Engineers, Seattle District
31. Loadmax materials – presentation slides; Hyundai Challenger Departure Track 11-10-01- Panel ; Hyundai Challenger Departure Track 12-15-01 Panel 2; and Hanjin Portland Departure Track 11-12-01 panel 3

ADVANCE RESOURCE MATERIALS – BENEFITS PANEL

All materials were provided to the panelists by the Corps, Portland District

1. Draft Supplemental Integrated Feasibility Report and Environmental Impact Statement; Columbia River Channel Improvement Project; Volume II; USACE, July 2002
2. CD. Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement, Columbia & Lower Willamette River Federal Navigation Channel; Volumes I & II; USACE, Portland District; August 1999
3. Integrated Feasibility Report for Channel Improvements and Environmental Impact Statement. Appendix C – Economics; USACE, August 1999
4. Economic Guidance Memorandum 00-06 Deep Draft Vessel Operating Costs; June 2000
5. Planning Guidance Notebook. ER1105-2-100. Table of Contents. Navigation Components; USACE, April 2000
6. Columbia River Channel Deepening: Oregon – Washington; Feasibility Cost Sharing Agreement and Initial Project Management Plan; USACE; April 1994
7. Delaware River Deepening Project, Comprehensive Reanalysis Needed; United States General Accounting Office, Report to Congressional Requesters (GAO-02-604), June 2002
8. Columbia River Channel Improvement Project Series of Articles, TV Stories, Editorials, Etc; No date
9. Newspaper clippings from The Oregonian newspaper:
 - “Digging Deeper (First of a three-part series): Port’s quest to deepen Columbia built on flawed, outdated data;” March 3, 2002
 - “Digging Deeper (Second of a three-part series): Salmon pay for shipping benefits;” March 4, 2002
 - “Critics fault new dredging analysis;” March 4, 2002
10. Review Procedures for Water Resources Planning, Panel on Peer Review, Committee to Assess the U.S. Army Corps of Engineers Methods of Analysis and Peer Review for Water Resources for Water Resources Project Planning, National Research Council, July 2002.

BENEFITS PANEL-- REQUESTED/PROVIDED SUPPLEMENTAL MATERIALS

All materials were provided to the panelists by the Corps, Portland District

1. Lower Columbia Navigation Guide, Port of Portland

2. Port of Portland Marine Economic Impact Study: Container Transportation Cost – Benefit Analysis, Prepared for Port of Portland December 2000 (HDR Engineering Report)
3. Seasonality Data for Port of Portland
4. Fleet Forecast for Columbia River for 2000, Final Report to Lower Columbia River Ports, May 1995, Martin O’Connell Associates
5. Container Ship Register, 2001
6. Multiport Container Benefit Analysis, Memo to Channel improvement Project Technical Review Panel from Jim Daly and Chris Fowler, Port of Portland, dated August 8, 2002
7. Brian Shenk’s meeting notes of discussions with Steve Johnson of Hanjin, on May 30, 2002 and with Todd Staple of Kline on June 20, 2002
8. Columbia River Forecasts Addendum – Grain Transportation Elasticity, BST Associates, August 8, 2002
9. Fleet Forecast for the Columbia River to 2020, Final Report, Submitted to Lower Columbia River Ports, dated May 1995, by Martin O’Connell Associates
10. Data on “Container Vessels, 1999-2002;” Corps CD: Excel Spreadsheet with vessel names, drafts, tonnage, etc.
11. Data on Bulk Commodity Projections, Corps CD: Excel Spreadsheet with forecasts for corn, soybeans, wheat etc.]
12. Loadmax material – presentation slides; Hyundai Challenger Departure Track 11-10-01- Panel ; Hyundai Challenger Departure Track 12-15-01 Panel 2; Hanjin Portland Departure Track 11-12-01 panel 3

MEDIA CONTACTS SINCE AUGUST 9, 2002

Cost Panelists: None

Benefits Panelists: All panelists communicated with a reporter from *The Oregonian* newspaper.

**COLUMBIA RIVER CHANNEL IMPROVEMENT PROJECT
TECHNICAL REVIEW OF REVISED BENEFIT AND COST ANALYSIS**

Fifth Avenue Suites Hotel
506 S.W. Washington at Fifth Avenue
Portland, Oregon 97204
August 9, 2002

Revised Agenda

- 8:00 Welcome, Introductions, Review Agenda, Meeting Ground Rules
- 8:15 Overview of the Technical Review Process
Robert Fisher, RESOLVE, Facilitator
- 8:30 Panelists' Views on Technical Review
 - Cost Panel -- Summary of Individual Views
- 9:30 Feedback from Individuals Who Made Presentations on Monday
Q & A Session with Panelists (*as time permits*)
- 10:00 Break
- 10:15 Panelists' Views on Technical Review
 - Benefits Panel -- Summary of Individual Views
- 11:15 Feedback from Individuals Who Made Presentations on Monday
Q & A Session with Panelists (*as time permits*)
- 11:45 Summary and Wrap Up
 - Preparation of a Summary of the Process
 - Comments on Draft Supplemental Integrated Feasibility Report and Environmental Impact Statement
 - Public Meetings
- 12:00 Adjourn